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Administrative Record File Coordinator
November 2002

008056

United States Department of Energy

Savannah River Site

Interim Record of Decision for the Old Solvent Tanks at the Old Radioactive Waste Burial Ground (U)

WSRC-RP-2000-4193
Rev. 1
August 2001

Prepared by:
Westinghouse Savannah River Company LLC
Savannah River Site
Aiken, SC 29808

Prepared for the U. S. Department of Energy under Contract No. DE-AC09-96-SR18500

SRS

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Prepared For
U.S. Department of Energy
and
Westinghouse Savannah River Company LLC
Aiken, South Carolina

Declaration for the Interim Record of Decision

Unit Name and Location

Old Solvent Tanks (650-01E through –22E), Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU-32

Savannah River Site, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Identification Number: SC1 890 008 989

Aiken, South Carolina

United States Department of Energy (USDOE)

The Old Solvent Tanks, 650-01E through –22E (OSTs), are a solid waste management unit regulated under the Resource Conservation and Recovery Act (RCRA) 3004(u) Solid Waste Management Unit/CERCLA. The Federal Facility Agreement (FFA) (FFA 1993) lists the OSTs as a component of the Old Radioactive Waste Burial Ground (ORWBG) (643-E) operable unit, which is a RCRA/CERCLA unit in Appendix C of the FFA for the Savannah River Site (SRS).

A modification to the SRS RCRA Part B Permit (SC1 890 008 989) is required for this interim action because a portion of this interim action will result in a final condition. The RCRA Part B Permit will be modified to reflect the actions to be performed under this interim record of decision (IROD). The required public participation requirements and regulatory approvals for the RCRA Permit modification will be met. This IROD satisfies the RCRA requirements for an interim measures work plan.

Statement of Basis and Purpose

This decision document presents the selected remedy for the OSTs, located at the SRS in Aiken, South Carolina. The interim remedy was chosen in accordance with the evaluation and decision-making process prescribed by CERCLA, as amended by the Superfund Amendments Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is permanently documented in the Administrative Record File for the ORWBG.

The State of South Carolina Department of Health and Environmental Control (SCDHEC) and the United States Environmental Protection Agency (USEPA) concur with the selected remedy.

Assessment of the Site

The response action selected in this IROD is necessary to protect worker and public health as well as the environment from potential releases of hazardous substances. Because these tanks are nearly empty, a large underground void exists. If the structural integrity of the tanks were to fail, the ground surface would collapse creating an immediate safety threat to workers and others who may be near the area. Collapse of the tanks may render the residual materials more accessible to workers and the public, thus creating an exposure risk. Exposure of the tanks' contents to the environment may also cause uncontrolled and unmonitored releases. Also, an overlying infiltration control system (cover/cap) will eventually be installed over the tanks and should the tanks collapse, damage to that protective system would be extensive.

Description of the Selected Remedy

Methods for stabilizing the tanks were evaluated and are documented in the corrective measures study/feasibility study (CMS/FS) for the ORWBG (WSRC 2000a). As documented in the statement of basis (SB)/interim action proposed plan (IAPP) for the OSTs (WSRC 2000b), the preferred remedial alternative is **Alternative OST II-e: Grouting of Tank Wastes *In Situ*.** The 22 OSTs will remain at their existing location within the ORWBG and be filled with grouting material. The primary function of the grout is to provide structural strength and stability for the tanks by filling the void with material that prevents collapse. Incidental to any mixing that may occur, residual material in the tanks will be incorporated into the grouting mixture. This incidental mixing will ultimately improve environmental protectiveness by rendering the residual material more immobile. The resulting cured (hardened) grouting mixture will also create a large solid mass that will make direct human contact with the residual materials more difficult and lessen the adverse effects to human health associated with that direct contact.

The proposed action to stabilize the OSTs is being pursued as an interim effort while the decision-making process continues for final closure of the ORWBG. As part of that final decision, potentially contaminated soil around the tanks and long-term monitoring and access controls will be addressed. Structural stabilization of the OSTs will simply serve as a component of the much larger closure effort of the ORWBG. Final closure of the ORWBG will be addressed in a separate record of decision (ROD).

Statutory Determinations

This interim action is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate, and is cost-effective. This action is interim and does not preclude the selection or use of alternative treatment technologies for this operable unit. Because this action is a component of the final remedy for the ORWBG, the statutory preference for remedies that reduce toxicity, mobility, or volume as a principal element will be addressed by the final closure of the ORWBG. Subsequent remedial actions will address the risks and uncertainties posed by the conditions at the ORWBG.

Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action. Because this is an IROD, review of this operable unit and of this remedy will continue as USDOE develops remedial alternatives for the ORWBG.

Data Certification Checklist

This IROD provides the following information:

- Constituents of interest and their respective concentrations,
- Baseline risk,
- Remedial action objectives and the basis for the objectives,
- Current and future land and groundwater use assumptions used in the IROD,
- Land and groundwater use that will be available at the site as a result of the selected remedy,
- Estimated capital, operation and maintenance, and total present worth cost; discount rate; and the number of years over which the remedy cost estimates are projected,
- Decision factor(s) that led to selecting the remedy (i.e., description of how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria), and
- How source materials constituting principal threats are addressed.

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Authorizing Signatures

8/21/01
Date

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DECISION SUMMARY

Interim Record of Decision for the Old Solvent Tanks at the Old Radioactive Waste Burial Ground (U)

WSRC-RP-2000-4193
Rev. 1
August 2001

Savannah River Site
Aiken, South Carolina

Prepared by:

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Aiken, South Carolina

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LIST OF ACRONYMS AND ABBREVIATIONS

ARARs	Applicable or Relevant and Appropriate Requirements
ALARA	as low as reasonably achievable
CA	contamination area
CAB	Citizens Advisory Board
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
Ci	curie
CIF	Consolidated Incineration Facility
CMI	corrective measures implementation
CMS/FS	corrective measures study/feasibility study
COBRA	computerized burial record analysis
CSM	conceptual site model
ETF	Effluent Treatment Facility
FCA	fixed contamination area
FFA	Federal Facility Agreement
HSWA	Hazardous and Solid Waste Amendments
IAPP	interim action proposed plan
IOU	integrator operable unit
IROD	interim record of decision
ISV	in-situ vitrification
LLC	limited liability company
MCLs	maximum contaminant levels
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act, 1969
NSST	New Solvent Storage Tanks
NPL	National Priorities List
O&M	operation and maintenance
ORWBG	Old Radioactive Waste Burial Ground, 643-E
OSTs	Old Solvent Tanks, 650-01E through –22E
pCi/g	picoCuries per gram
PP	proposed plan
PTSM	principal threat source material
PUREX	plutonium-uranium extraction
RAIP	remedial action implementation plan
RAOs	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RGs	remedial goals
RI	Remedial Investigation
ROD	record of decision
SB	statement of basis

SCDHEC	South Carolina Department of Health and Environmental Control
SCHWMR	South Carolina Hazardous Waste Management Regulation
SRS	Savannah River Site
TRU	transuranic
USC	United States Code
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
WIPP	Waste Isolation Pilot Plant
WSRC	Westinghouse Savannah River Company

I. SAVANNAH RIVER SITE AND OPERABLE UNIT NAME, LOCATION, AND DESCRIPTION

Old Solvent Tanks (650-01E through –22E), Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number: OU-32

Savannah River Site, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Identification Number: SC1 890 008 989

Aiken, South Carolina

United States Department of Energy (USDOE)

Savannah River Site (SRS) occupies approximately 310 square miles of land adjacent to the Savannah River, principally in Aiken and Barnwell counties of South Carolina (Figure 1). SRS is located approximately 25 miles southeast of Augusta, Georgia, and 20 miles south of Aiken, South Carolina.

The USDOE owns SRS, which historically produced tritium, plutonium, and other special nuclear materials for national defense and the national space exploration program. Chemical and radioactive wastes are by-products of nuclear material production processes. Hazardous substances, as defined by CERCLA, are currently present in the environment at SRS.

The Federal Facility Agreement (FFA) (FFA 1993) for SRS lists the Old Radioactive Waste Burial Ground (including Solvent Tanks 650-01E - 22E), 643-E (ORWBG) as a Resource Conservation and Recovery Act (RCRA)/CERCLA unit requiring further evaluation. The ORWBG operable unit required further evaluation through an investigation process that integrates and combines the RCRA Facility Investigation (RFI) process with the CERCLA remedial investigation (RI) process to determine the actual or potential impact to human health and the environment of releases of hazardous substances to the environment.

II. SITE AND OPERABLE UNIT COMPLIANCE HISTORY

SRS Operational and Compliance History

The primary mission of SRS was to produce tritium, plutonium, and other special nuclear materials for national defense programs. Production of nuclear materials for the defense program was discontinued in 1988. SRS still provides nuclear materials for the national space exploration program, as well as for medical, industrial, and research efforts. SRS also still maintains a major role in the stabilization of weapons-related nuclear materials and waste. As a result of the numerous nuclear material production and treatment processes, chemical and radioactive wastes were generated. Much of these wastes have been treated, stored, and in some cases, disposed at SRS. Although historical disposal practices were similar to commercial and non-nuclear industries and were even state-of-the-art, they nonetheless resulted in soil and groundwater contamination.

Hazardous waste materials handled at SRS are managed under RCRA, a comprehensive law requiring responsible management of hazardous waste. Certain SRS activities require South Carolina Department of Health and Environmental Control (SCDHEC) operating or post-closure permits under RCRA. SRS received a RCRA hazardous waste permit from the SCDHEC, which was most recently renewed on September 5, 1995. On March 30, 2000, SRS submitted an application to renew the 1995 permit. Module IV of the Hazardous and Solid Waste Amendments (HSWA) portion of the RCRA permit mandates corrective action requirements for non-regulated solid waste management units subject to RCRA 3004(u) and 40 Code of Federal Regulations (CFR) 264.101.

On December 21, 1989, SRS was added to the National Priorities List (NPL). This inclusion created a need to integrate the established RFI program with CERCLA requirements to provide for a focused environmental program. In accordance with Section 120 of CERCLA 42 United States Code (USC) Section 9620, USDOE has negotiated a FFA (FFA 1993) with the United States Environmental Protection Agency (USEPA) and SCDHEC to coordinate remedial activities at SRS into one comprehensive strategy which fulfills these dual regulatory requirements. USDOE functions as the lead agency for remedial activities at SRS, with concurrence by the USEPA - Region IV and the SCDHEC.

Operable Unit Operational and Compliance History

The Old Solvent Tanks, 650-01E through –22E (OSTs) are a subunit of the ORWBG operable unit. The ORWBG is listed in Appendix C of the FFA as "Old Radioactive Waste Burial Ground (Including Solvent Tanks 650-01E - 22E), 643-E". The ORWBG is part of the central disposal area for solid radioactive waste at SRS known as the Burial Ground Complex (Figure 2). Other operable units in the Burial Ground Complex include the Mixed Waste Management Facility, the Low-Level Radioactive Waste Disposal Facility, Solvent Tanks S23-S30, and Solvent Tank 32 (Figure 2). The Burial Ground Complex is located in the interior of SRS, approximately 6 miles from the nearest SRS boundary (Figure 1).

The OSTs comprise 22 underground storage tanks designated 650-01E through –22E (Figure 3). In some SRS documents, the tanks are identified as S01 through S22. The tanks were installed at various dates from 1955 to 1968. Some of these tanks were utilized as fuel storage tanks at SRS and other federal facilities prior to their underground emplacement in the ORWBG.

All 22 tanks were constructed of thin-walled (approximately 0.75-inch) milled steel. Each tank is equipped with one or two riser/vent pipes (Figure 3). The tanks have different sizes and capacities. The diameters range from 7.5 to 11.0 feet, and the lengths range from 18.0 to 38.5 feet. The capacities range from 6,769 to 27,016 gallons. The total capacity of all 22 tanks is 294,308 gallons.

The tanks were placed underground in a horizontal position. The depths to the top of the tanks range from 6 inches to 7 feet, 4 inches. Most of the tanks are slightly inclined (tilted); several are inclined more than 6 inches.

Hundreds of thousands of gallons of solvent were used in the chemical separations facilities at SRS in a process that removes plutonium and uranium from spent fuel rods. The spent solvent generated from this plutonium-uranium extraction (PUREX) process consisted of a mixture of tri-n-butyl phosphate and dodecane. When the solvent became degraded and no longer useful, it was managed as low-level radioactive waste.

Until the mid-1970s, this low-level waste stream was temporarily stored in the 22 OSTs where it was "aged" to allow the short-lived fission and activation products to decrease through radioactive decay. Once the solvent aged (about 6 months to 12.4 years), it was burned in pans open to the atmosphere. Open pan burning was discontinued in 1972. Operational use of the tanks ceased in 1974; no additional solvent was placed in the tanks after 1974. From March 1977 through May 1978, the contents of tanks 650-01E through –18E were pumped out to the extent practical and consolidated into tanks 650-19E through -22E. From November 1980 through January 1981, the contents of 650-19E through -22E were transferred out of the ORWBG into new tanks S23 through S30 in the Low-Level Radioactive Waste Disposal Facility. All 22 tanks of the OSTs were pumped to the extent practical, however some residual liquids and/or solids remain in the bottom of each tank (see Section V for a discussion of the residual tank contents).

In 1996, SCDHEC and USEPA issued an interim record of decision (IROD) (WSRC 1996) to place a soil cover on the ORWBG. The interim action installed a 2- to 8-foot-thick low permeability native soil cover and an associated drainage network over most of the ORWBG to minimize infiltration and leaching of the buried waste. However, the native soil cover was not placed over the OSTs, pending remediation.

The OSTs are located near the middle of the ORWBG in the Burial Ground Complex at SRS (Figure 2). General public access to SRS and the Burial Ground Complex is prohibited by perimeter fences, guards, and security patrols. Access by SRS workers to areas within the Burial Ground Complex is controlled by physical and administrative controls. The physical barrier to the Burial Ground Complex is an 8-ft high chain-link and barbed-wire fence. Administrative controls include orange marker balls and signs identifying the ORWBG as a CERCLA waste unit and as an Underground Radioactive Materials Area. At the OSTs, a chain barrier and signs provide administrative controls to prevent prolonged exposure to fixed contamination on the riser pipes (see Section VII for a summary of the unit risks). An aerial photograph of the ORWBG and OSTs is provided as Figure 4.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

Both RCRA and CERCLA require the public be given an opportunity to review and comment on the draft permit modification and proposed remedial alternative. Public participation requirements are listed in South Carolina Hazardous Waste Management Regulation (SCHWMR) R.61-79.124, 40 CFR 124, and Sections 113 and 117 of CERCLA 42 USC Sections 9613 and 9617. These requirements include establishment of an Administrative Record File that documents the investigation and selection of remedial alternatives and allows for review and comment by the public regarding those alternatives. The Administrative Record File must be established at or near the facility at issue. The SRS Public Involvement Plan (USDOE 1994) is designed to facilitate public involvement in the decision-making process for permitting, closure, and the selection of remedial alternatives. The SRS Public Involvement Plan addresses the requirements of RCRA, CERCLA, and the National Environmental Policy Act, 1969 (NEPA). SCHWMR R.61-79.124 and Section 117(a) of CERCLA, as amended, require the advertisement of the draft permit modification and notice of any proposed remedial action and provide the public an opportunity to participate in the selection of the remedial action. The *Statement of Basis/Interim Action Proposed Plan for the Old Solvent Tanks at the Old Radioactive Waste Burial Ground* (WSRC 2000b), a part of the Administrative Record File, highlights key aspects of the investigation and identifies the preferred action for addressing the OSTs.

The FFA Administrative Record File, which contains the information pertaining to the selection of the response action, is available at the following locations:

US Department of Energy
Public Reading Room
Gregg-Graniteville Library
University of South Carolina – Aiken
171 University Parkway
Aiken, South Carolina 29801
(803) 641-3465

Thomas Cooper Library
Government Documents Department
University of South Carolina
Columbia, South Carolina 29208
(803) 777-4866

The RCRA Administrative Record File for SCDHEC is available for review by the public at the following locations:

The South Carolina Department of Health and Environmental Control
Bureau of Land and Waste Management
8901 Farrow Road
Columbia, South Carolina 29203
(803) 896-4000

Lower Savannah District Environmental Quality Control Office
206 Beaufort Street, Northeast
Aiken, South Carolina 29801
(803) 641-7670

A modification to the SRS RCRA Part B Permit (SC1 890 008 989) is required for this interim action because a portion of this interim action will result in a final condition. The RCRA Part B Permit will be modified to reflect the actions to be performed under this IROD. The required public participation requirements and regulatory approvals for the

RCRA Permit modification will be met. This IROD satisfies the RCRA requirements for an interim measures work plan.

The public was notified of the public comment period through mailings of the *SRS Environmental Bulletin*, a newsletter sent to citizens in South Carolina and Georgia, and through notices in the *Aiken Standard*, the *Allendale Citizen Leader*, the *Augusta Chronicle*, the *Barnwell People-Sentinel*, and *The State* newspaper. The public comment period was also announced on local radio stations.

The statement of basis (SB)/interim action proposed plan (IAPP) 45-day public comment period began on April 4, 2001 and ended on May 18, 2001. A Responsiveness Summary, prepared to address comments received during the public comment period, is provided in Appendix A of the IROD.

IV. SCOPE AND ROLE OF THE OPERABLE UNIT WITHIN THE SITE STRATEGY

RCRA/CERCLA Programs at SRS

RCRA/CERCLA units at SRS (including the ORWBG and OSTs) are subject to a multi-stage RI process that integrates the requirements of RCRA and CERCLA as outlined in the FFA (FFA 1993). The major steps in this integrated RCRA/CERCLA process are:

- Investigation and characterization of potentially impacted environmental media (such as soil, groundwater, and surface water) comprising the waste site and surrounding areas,
- Evaluation of risk to human health and the local ecological community,
- Screening of possible remedial actions to identify technologies that protect human health and the environment,
- Implementation of the selected alternative,
- Documentation that the remediation has been performed competently, and
- Evaluation of the effectiveness of the technology (remedy).

The steps of this process are iterative and include decision points that require concurrence among USDOE as the lead agency and owner/operator and USEPA and SCDHEC as regulatory oversight agencies. Public input is an integral step in this decision-making process. Please refer to Figure 5.

Operable Unit Remedial Strategy

The ORWBG is presently undergoing the decision-making process for its final remedial response (closure). Because the OSTs are within the ORWBG operable unit, any final action implemented at the ORWBG (e.g., rainwater infiltration control system, institutional controls, etc.) would include the OSTs. The final remedy for the ORWBG has not yet been selected but, as documented in the CMS/FS (WSRC 2000b), all of the alternatives under consideration first require stabilization of the OSTs. This IROD addresses only the tanks and the residual materials inside the tanks. Soil contamination for the entire ORWBG will be addressed by the final action for the ORWBG.

Groundwater has been contaminated by releases from the various facilities in the Burial Ground Complex (WSRC 1995, WSRC 1997a). The contaminated groundwater is currently managed by the corrective action program in the SRS RCRA Part B permit for the Mixed Waste Management Facility (WSRC 1995) in accordance with Settlement Agreement 87-52-SW. Under that permit, institutional controls for the Burial Ground Complex, including groundwater monitoring, are required for a period of 100 years or longer.

The OSTs and ORWBG are within the Fourmile Branch integrator operable unit (IOU). An IOU is a surface water body that represents the combined contamination discharged to the surface water body from all source units in the watershed. Several other source and groundwater operable units within this watershed are being investigated and evaluated to determine impacts, if any, to associated streams and wetlands. Subsequent to those investigations, remedial actions may be undertaken.

V. OPERABLE UNIT CHARACTERISTICS

Conceptual Site Model for the OSTs

To better understand the risks posed against current and future receptors, a conceptual site model (CSM) of the unit was developed. The CSM illustrates the sources of contamination, potential exposure pathways, and exposure media relevant to the unit. The CSM is provided as Figure 6.

Media Assessment

A comprehensive investigation and review of historical disposal records, operational records, and other documents was conducted for the ORWBG and OSTs. The findings from this records review were integrated with aerial photographs, construction drawings, health physics burial maps, the computerized burial record analysis (COBRA) database (a historical catalog of individual disposals), and even interviews with current and former SRS staff. This investigation is documented in *Source Term for the Old Radioactive Waste Burial Ground (ORWBG), Savannah River Site* (WSRC 1997b). Historical information was augmented by non-intrusive investigations such as groundwater monitoring (WSRC 1997a), soil gas surveys, ambient air monitoring of volatiles, monitoring of tritiated atmospheric vapor and standing surface water, and ground penetrating radar surveys. A summary of the characterization techniques and results is provided in *Corrective Measures Study/Feasibility Study for the Old Radioactive Waste Burial Ground 643-E* (WSRC 2000a).

Video surveys and sampling of the OSTs were performed to better understand the current condition of the tanks and their contents (WSRC 1998a,b,c). Video surveys with a remote camera were conducted for each tank. The remote video surveys revealed no visible evidence of tank breaching. The video surveys were used to verify and refine the estimated volume of residual materials (liquids and solids) that remain in the OSTs. Currently, four of the tanks contain no liquids. The other tanks have liquid volumes ranging from 5 to 1,995 gallons for a total of 5,635 gallons. On average, approximately 2 percent of the volume of the tanks is filled with liquid, with the largest percentage being 8 percent in Tank 20. Except for Tank 6, all tanks contain solids. Volumes of solids in the tanks range from 0.267 to 36.38 cubic feet. On average, 0.3 percent of the tank volume is filled with solids.

The tanks were also sampled in 1998. Sampling was performed to the extent practical given the small amount of residual material in the tanks and the limited access to the tanks. Aqueous liquid samples were obtained from 14 tanks, organic liquid samples were obtained from 2 tanks, and sludge samples were obtained from 12 tanks. Analytical results for constituents of interest are presented in Table 1. Analytical techniques and complete results are summarized in *Workplan/RCRA Facility Investigation/ Remedial Investigation Report for the Old Radioactive Waste Burial Ground 643-E, S01-S22* (WSRC 1997c) and in *Addendum to the Workplan/RCRA Facility Investigation/ Remedial Investigation Report for the Old Radioactive Waste Burial Ground 643-E, S01-S22* (WSRC 2000c).

VI. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The OSTs are located within a Heavy Industrial (Nuclear) zone. The USDOE will maintain control of this area. In the *Savannah River Site Future Use Project Report* (USDOE 1996), the USDOE has taken steps to prohibit residential use of SRS land in the vicinity of the OSTs through its plan for current and future use of the SRS. Therefore, future residential use and potential residential water usage in the area are not anticipated. Current and anticipated future land use is industrial.

VII. SUMMARY OF OPERABLE UNIT RISKS

Baseline Risk Assessment

Because a detailed characterization was not performed on the ORWBG, a conventional baseline risk assessment, whose basis is the result of characterization, was not performed. The decision not to undergo detailed characterization, which typically involves intrusive sampling into the unit, was mutually agreed upon by USEPA, SCDHEC, and USDOE. The three agencies felt that: (1) intrusive sampling may cause or accelerate releases of buried hazardous substances to the environment; (2) the handling of radioactive materials or toxic substances poses a significant risk to workers; (3) intrusive sampling poses many implementation complexities; (4) the quality of the resulting data (should sampling be performed) would not significantly improve the understanding of the conditions at the ORWBG; (5) the results of sampling would not significantly improve the ability to evaluate and select the final remedy; and (6) uncertainties presented by the lack of detailed characterization data could be managed by the final remedy.

The three agencies recognize that remediation will reduce risks and will remove some exposure pathways. SRS did perform limited quantitative risk evaluations and qualitative risk evaluations to sufficiently improve the understanding of relative risks so that the three agencies can proceed with the remedy selection process. Human health and ecological risks posed by the OSTs include the following:

Exposure Risk at Ground Surface: Although the tanks are underground and covered by up to several feet of soil, there remains some exposure risk at the ground surface. The OST riser pipes, which extend from the tanks to the surface, are contaminated with fixed radioactive material and consequently, the area is controlled as a Fixed Contamination Area (FCA). An FCA is defined as an area with radioactive material that cannot be readily removed from surfaces by nondestructive means, such as casual contact, wiping, brushing, or laundering. The FCA is within a larger area surrounding the OSTs that is currently controlled as a Contamination Area (CA). This designation provides administrative controls to prevent current SRS workers (who perform routine maintenance activities in the area) from prolonged exposure to the riser pipes. The maximum dose expected on contact with the OST riser pipes is less than (<) 5 millirem per hour. The whole body penetrating dose (gamma) at the ground surface of the ORWBG and OSTs and the OST riser pipes is below the detection limit of current field portable radiation instrumentation. The maximum dose expected at the ground surface of an area posted as a CA is < 5 millirem per hour. Surface exposure risk will be managed by the final action for the ORWBG operable unit; this interim action is not intended to mitigate surface risk.

Exposure Risk to Tank Contents: The residual material in the tanks is a discernable source and there are high levels of radionuclides (Table 1). As such, the residual tank contents are considered principal threat source material (PTSM) (i.e., a material that warrants a preference for treatment as part of the selected remedy, to the extent practicable). Although the residual material is currently buried below the land surface, it would pose an unacceptable risk to human health and the environment if exposure were to occur. For example, if an inadvertent intruder were to gain access to the tanks, unacceptable exposure would occur and the tank contents could be released into surrounding soils where it may impact plants and animals. Alternatively, if an opening in the top of one of the tanks were to develop, rainwater could accumulate in the tank, overflow the tank, and contaminate the environment. These risks will be addressed by the interim action.

Tank Collapse: In the long term, if the tanks were to structurally fail, they would collapse because they are nearly empty. Any overlying infiltration control system that might be placed as a final action would be damaged and there would be the potential for release to the environment. This risk will be addressed by the interim action.

None of the OSTs contain a sufficient quantity of fissile material to cause a spontaneous and self-sustaining nuclear chain reaction under any of the alternatives considered. Simply put, nuclear criticality cannot occur (WSRC 2000b).

Summary of Contaminant Migration

Fate and transport calculations (WSRC 2000a) were performed to assess the leachability threat posed by the ORWBG and the OSTs. The leachability risks posed by the OSTs include the following:

Risk to Surface Waters: The fate and transport calculations indicate that, under a worst-case scenario where there was an instantaneous release of all residual materials in the tanks and rainwater were to flush and transport that material to the groundwater, the release would not impact groundwater above standards (maximum contaminant levels [MCLs]) at the seepline.

Risk to Groundwater Quality Under the ORWBG: The fate and transport calculations indicate that under the same worst-case scenario of instantaneous release, the groundwater immediately under the ORWBG would be impacted above MCLs.

VIII. REMEDIAL ACTION OBJECTIVES AND REMEDIAL GOALS

As documented in the CMS/FS (WSRC 2000a), the remedial action objectives (RAOs) for the OSTs are:

- Stabilize the tanks to prevent collapse,
- Minimize the exposure risk to workers (current and future),
- Prevent or mitigate inadvertent intrusion via intruder access controls, and
- Prevent or mitigate leaching of contaminants present in the tanks and surrounding soils to groundwater above MCLs and discharge to surface water above standards.

There are no constituent-specific remedial goals (RGs) associated with this interim action.

IX. DESCRIPTION OF ALTERNATIVES

The proposed action to stabilize the OSTs is being pursued as an interim effort while the decision-making process continues for final closure of the ORWBG. The alternatives address only the tanks and the residual material within the tanks, and do not address any potential soil contamination around the tanks or long-term monitoring or access controls. Contaminated soil for the entire ORWBG will be addressed in a separate SB/PP for the ORWBG operable unit as a whole. All viable alternatives in that SB/PP are anticipated to include institutional controls (long-term monitoring, site maintenance, and access controls, including land use controls) as a component of the final remedy.

Remedy Components, Common Elements, and Distinguishing Features of Each Alternative

The alternatives for the OSTs (Table 2) are composed of the following primary technologies:

Stabilization (Grouting). Stabilization, either physical or chemical, may be applied to storage tanks. In the case of physical stabilization, grout occupies void spaces and hardens into a cement-like matrix creating a solid mass. Grouting may also render residual materials more immobile because of the incident mixing with grout. Conventional grouting fluids are typically composed of cement or bentonite. The material that is selected must be compatible with the tanks' residual material. The grout must be able to harden and remain competent in the presence of that material.

Vitrification. In situ vitrification (ISV) uses electrical power to heat and melt material into glass. ISV greatly reduces contaminant mobility via leaching and biotic uptake by immobilizing the contaminants in a glassy microcrystalline product. Due to the high temperature induced during vitrification, the process also results in the destruction or removal of organic contaminants in the waste medium. Furthermore, ISV provides long-term stability to the site and reduces the long-term possibility of human intrusion.

Removal/Disposal. Removal/disposal would entail removal of the liquids and solids in the tanks using a slurry process. If the removed material were determined to be transuranic (TRU) waste, the slurry would be stabilized by solidification, packaged, and temporarily stored on the TRU Pads at SRS pending eventual transport to the Waste Isolation Pilot Plant (WIPP). If the removed material were to be determined to be hazardous, then RCRA waste management requirements would also be imposed. If removal were to be selected, additional sampling may be needed to ensure the waste meets waste acceptance criteria of the receiving treatment/storage/disposal facility. Removal and disposal of the metal tanks themselves is technically impractical – primarily because the work would present unacceptable risk to workers. Because the tanks are already situated in an area containing radioactive wastes, the exposure risk to remove the tanks cannot be justified.

The alternatives considered for the interim action are listed below. Detailed descriptions of these alternatives are provided in the CMS/FS for ORWBG (WSRC 2000a).

OST I-a: No Action: No Action would consist of no remedial activities to the OSTs. The capital cost would be $0, and the operation and maintenance (O&M) cost would be $32,000.

OST II-d: Vitrification of Tank Wastes *In Situ*: For Alternative OST II-d, the residual liquid and solid materials in the tanks, and the tanks themselves, would be vitrified in place. The tanks would be accessed and glass frit and other additives would be placed in the tanks. Electrodes would be placed in the mixture and resistance heating used to form a solid microcrystalline glass matrix. Additional backfill would be added to the tanks to fill any remaining voids. The capital cost would be $11 million, and the O&M cost would be $82,000.

OST II-e: Grouting of Tank Wastes *In Situ*: For Alternative OST II-e, the OSTs would be filled with grout. Grouting would occur with the tanks in their current state (i.e., containing the residual liquids and solids). Grout would be pumped into the tanks until all voids are filled. The capital cost would be $4.3 million, and the O&M cost would be $82,000.

OST II-f: Removing and Treating Liquid Tank Wastes and Grouting of Solid Tank Wastes *In Situ*: Under Alternative OST II-f, the remaining liquids would be removed prior to grouting. The liquids would be transferred to the New Solvent Storage Tanks (NSST) and processed in the Consolidated Incineration Facility (CIF). After removal of the liquids, the solids (sludges) in the tanks would be grouted. Grout would be pumped into the tanks until all voids are filled. The capital cost would be $186.9 million, and the O&M cost would be $82,000.

OST II-j: Removing and Treating All Tank Wastes, and Stabilizing Empty Tanks with Grout: Under Alternative OST II-j, the remaining liquids and solids in the tanks would be removed using a slurry process. If it meets the definition of TRU waste, the waste would be stabilized by solidification, packaged, and stored on the TRU Pads and eventually sent to WIPP. The empty tanks would then be filled with grout. The capital cost would be $24.1 million, and the O&M cost would be $82,000.

X. COMPARATIVE ANALYSIS OF ALTERNATIVES

Nine criteria, derived from the statutory requirements of CERCLA Section 121, have been established by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). In selecting the preferred alternative, the CERCLA criteria were used to evaluate the alternatives. The criteria are as follows:

1. Overall protection of human health and the environment
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume through treatment
5. Short-term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community acceptance

In selecting the preferred alternative, the above criteria are used to evaluate the alternatives. The first two criteria are threshold criteria for which the remedial alternative must satisfy for consideration. See Table 3 for the list of the ARARs for the selected alternative. The third through seventh criteria are balancing criteria against which key tradeoffs (advantages versus disadvantages) are identified and "balanced" for selection of a preferred alternative. Comparative evaluations of all the remedial action alternatives against the first seven criteria are detailed in the SB/IAPP and summarized in Table 4. The preferred alternative is further evaluated in this document using the final two criteria, which are State acceptance and community acceptance.

Key considerations in the remedy selection process include the following:

(1) The No Action base case does not meet the threshold criteria for protection of human health and the environment or compliance with ARARs.

(2) Grouting poses a low risk to the workers who would be implementing the remedy, sufficiently mitigates long-term structural collapse of the tanks, provides some mitigation of potential leachability risks, and is cost-effective.

(3) Vitrification would provide long-term permanence and protection against leaching, but it is an emerging technology and there are some concerns with the technical feasibility of implementation at the OSTs. Vitrification poses potential risks to the workers who would be implementing the remedy because it would require construction of access points in the tanks, and off-gassing would likely require a hood to mitigate inhalation risk to the workers. Vitrification is not cost-effective.

(4) Removal alternatives present risks to the workers who would be performing the removal. Removal is not consistent with SRS's program of keeping worker exposure as low as reasonably achievable (ALARA). Removal alternatives increase the likelihood of environmental releases because the buried material is disturbed. Removal alternatives present numerous waste treatment, storage and disposal, technical, and legal complexities. Removal alternatives are not cost-effective.

Table 4 provides the comparative analysis of alternatives.

XI. THE SELECTED REMEDY

The selected remedy is **OST II-e**. The solvent tanks will remain in place and all 22 tanks will be completely filled with grout. The grout will be injected into the tanks through the existing risers. The grout formula will be determined during the remedial design phase of the project.

Grouting is selected as the preferred alternative because this alternative affords the structural stability needed to prevent collapse, poses the lowest risk to the workers who will be implementing the remedy, provides some reduction in leachability, presents the fewest implementability concerns, and is the lowest cost alternative that still meets the RAOs (Table 4). Because the residual material in the tanks is considered PTSM, there is a general preference for a remedy that includes some form of treatment. To the extent practicable, grouting satisfies this preference for treatment.

Grouting meets the RAO to stabilize the tanks because the tanks will be filled with grout, thus preventing collapse. Grouting satisfies the RAO to minimize risk to workers because the risk to worker exposure is relatively low compared to other more intrusive response actions (such as removal). Grouting meets the RAO to prevent or mitigate inadvertent intrusion because the resulting solid mass will prevent accidental, inadvertent access into the tanks. Grouting, coupled with the low permeability cap which will be placed over the tanks as part of the final action for the ORWBG, will meet the RAO to prevent or mitigate leaching of contaminants above MCLs by reducing the threat of release of contamination from the tanks into the soil and by reducing infiltration. Grouting will reduce the leachability threat through incidental mixing of the residual tank contents with grout, by providing a low permeability material (the grout itself) over any remaining material in the bottom of the tanks, and by reducing the likelihood of tank collapse and instantaneous release of the contents into the soil.

SCDHEC and USEPA concurrence with the proposed interim action has been received.

Community acceptance of the proposed interim action was determined by giving the public an opportunity to comment on the SB/IAPP during the public comment period. No comments were received from the public that would change the selection of the preferred alternative. Public comments concerning the interim remedy are addressed in the Responsiveness Summary of this IROD.

This remedy may change as a result of the remedial design or construction processes. Changes to the remedy described in the IROD will be documented in the Administrative Record utilizing a memo, an Explanation of Significant Difference, or IROD Amendment.

Cost Estimate for the Selected Remedy

The cost estimate to grout the tanks is detailed in Table 5. The estimated direct capital cost is $1.9 million. Indirect capital cost is $2.4 million. The present value of O&M costs is $82,000. The total estimated present value cost is $4.4 million.

Estimated Outcomes of Selected Remedy

Upon completion of the selected remedy, SRS will be able to operate heavy machinery in the area without the risk of tank collapse. This will allow implementation of a final remedy for the ORWBG as a whole, such as installation of an infiltration control system (e.g., low permeability cover/cap). The stabilized tanks will be strong enough to support the weight of the infiltration control system without failure and associated subsidence-related damage to the overlying low permeability cover/cap.

Grouting will provide reduction in mobility by (1) increasing the structural stability of the tanks, thereby preventing the worst-case scenario of simultaneous tank failure and instantaneous material release, (2) incorporating some of the residual material into the grout matrix, and (3) providing material of low permeability (the grout itself) in the tanks, which will reduce infiltration through the tanks. In addition, the resulting solid mass will reduce the possibility of inadvertent intrusion and exposure in the long-term.

XII. STATUTORY DETERMINATIONS

The OSTs pose a potential threat to human health and the environment. In addition, the tanks must be stabilized before the final action for the ORWBG can be implemented.

This interim action is protective of human health and the environment, complies with Federal and State ARARs for this limited-scope action, and is cost-effective. Stabilization by grouting offers permanence and, because the residual material in the tanks is considered PTSM, uses treatment to the extent practicable. Subsequent remedial actions will address the risks and uncertainties posed by the conditions at the ORWBG.

Because this remedy will result in hazardous substances remaining on site above health-based levels, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. Because this is an IROD, review of this site and of this remedy will continue while the decision-making process continues for final closure of the ORWBG.

XIII. EXPLANATION OF SIGNIFICANT CHANGES

The SB/IAPP provided for involvement with the community through a document review process and a public comment period. Comments received are addressed in the Responsiveness Summary in Appendix A. No significant changes to the selected remedy resulted from the public comments.

XIV. RESPONSIVENESS SUMMARY

The Responsiveness Summary is included as Appendix A of this document.

XV. POST-ROD DOCUMENT SCHEDULE AND DESCRIPTION

Figure 7 is an interim action implementation schedule showing the post-IROD document submittals and the remedial action start date. Construction of the interim action is scheduled to begin in November 2001. The interim action is expected to be completed by February 2003.

A final action for the entire ORWBG will be implemented after completion of the interim action. The completion dates for the final SB/PP and ROD have not yet been determined. The final action for the ORWBG will be proposed in a final SB/PP, which will be offered for public review. The public comment period for the final SB/PP will be announced in newspapers and on local radio stations.

XVI. REFERENCES

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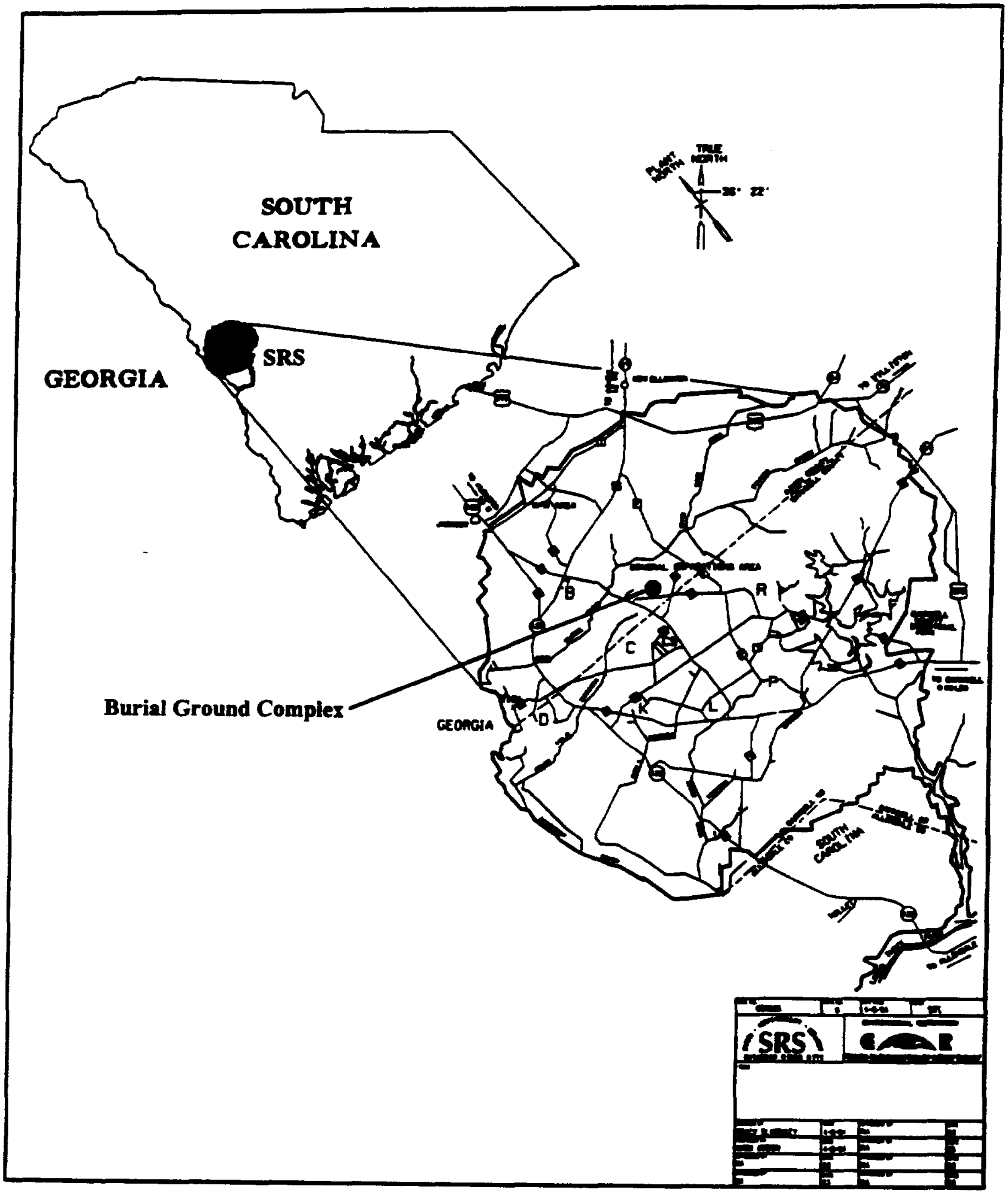

Figure 1. Location of the Burial Ground Complex at SRS

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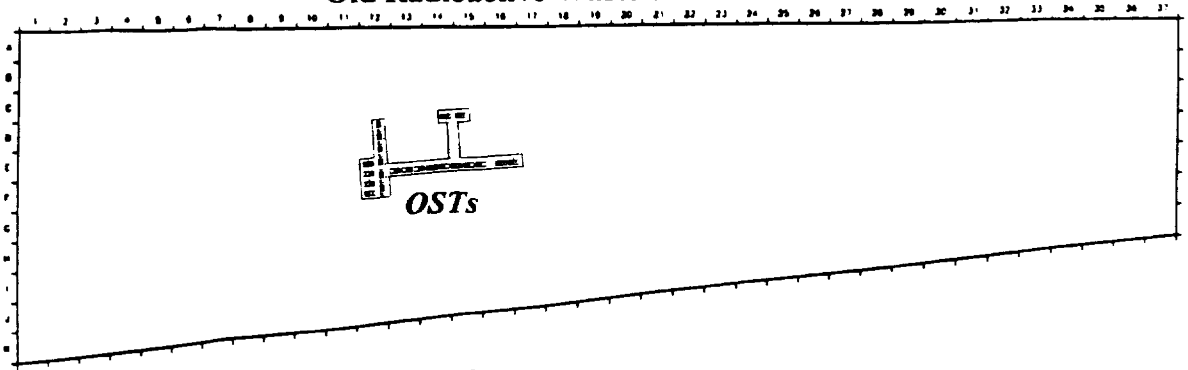
Esther Palmer
Administrative Record File Coordinator
November 2002

Old Radioactive Waste Burial Ground



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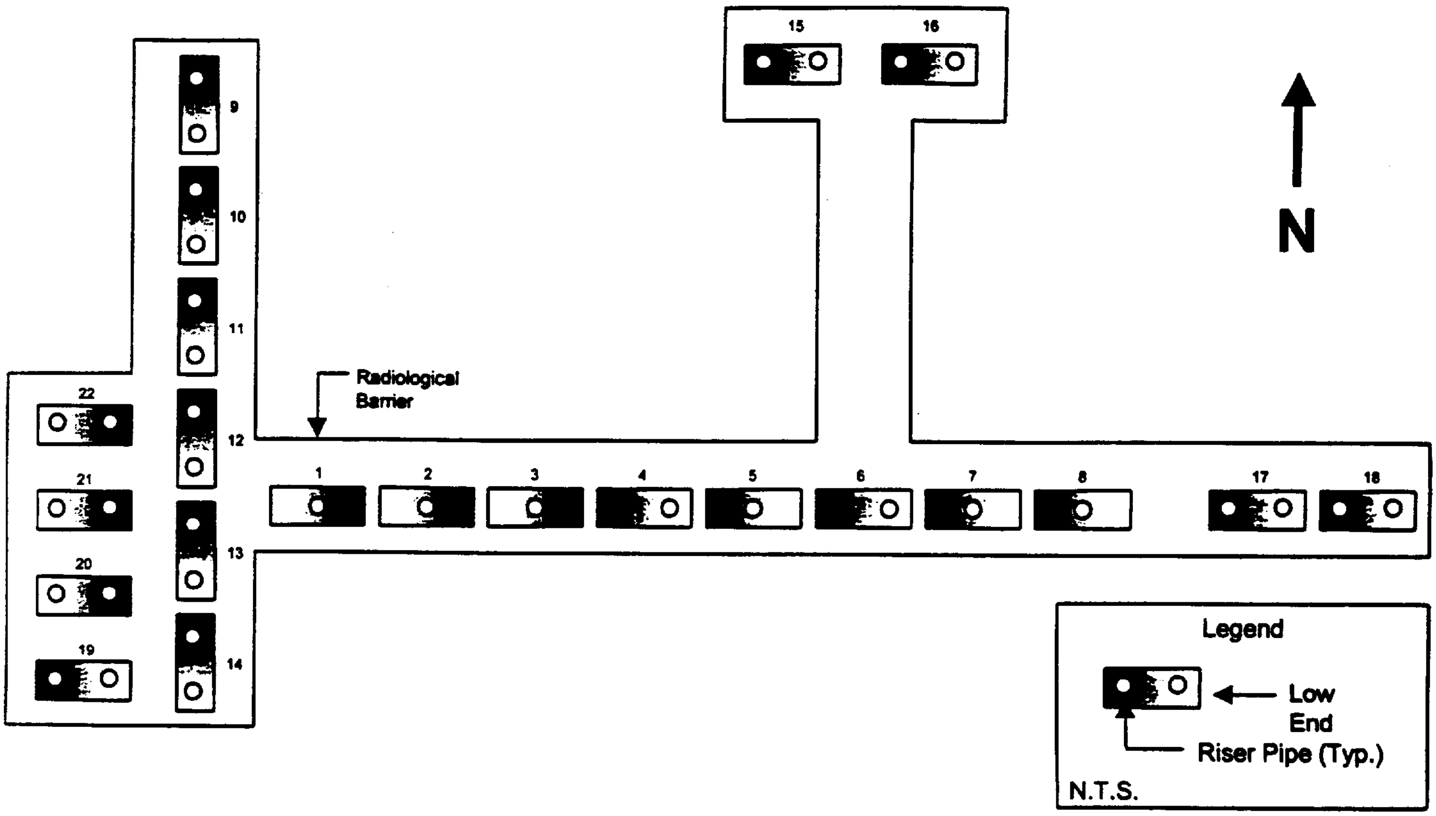

Figure 3. Map of the OSTs

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Administrative Record File Coordinator
November 2002

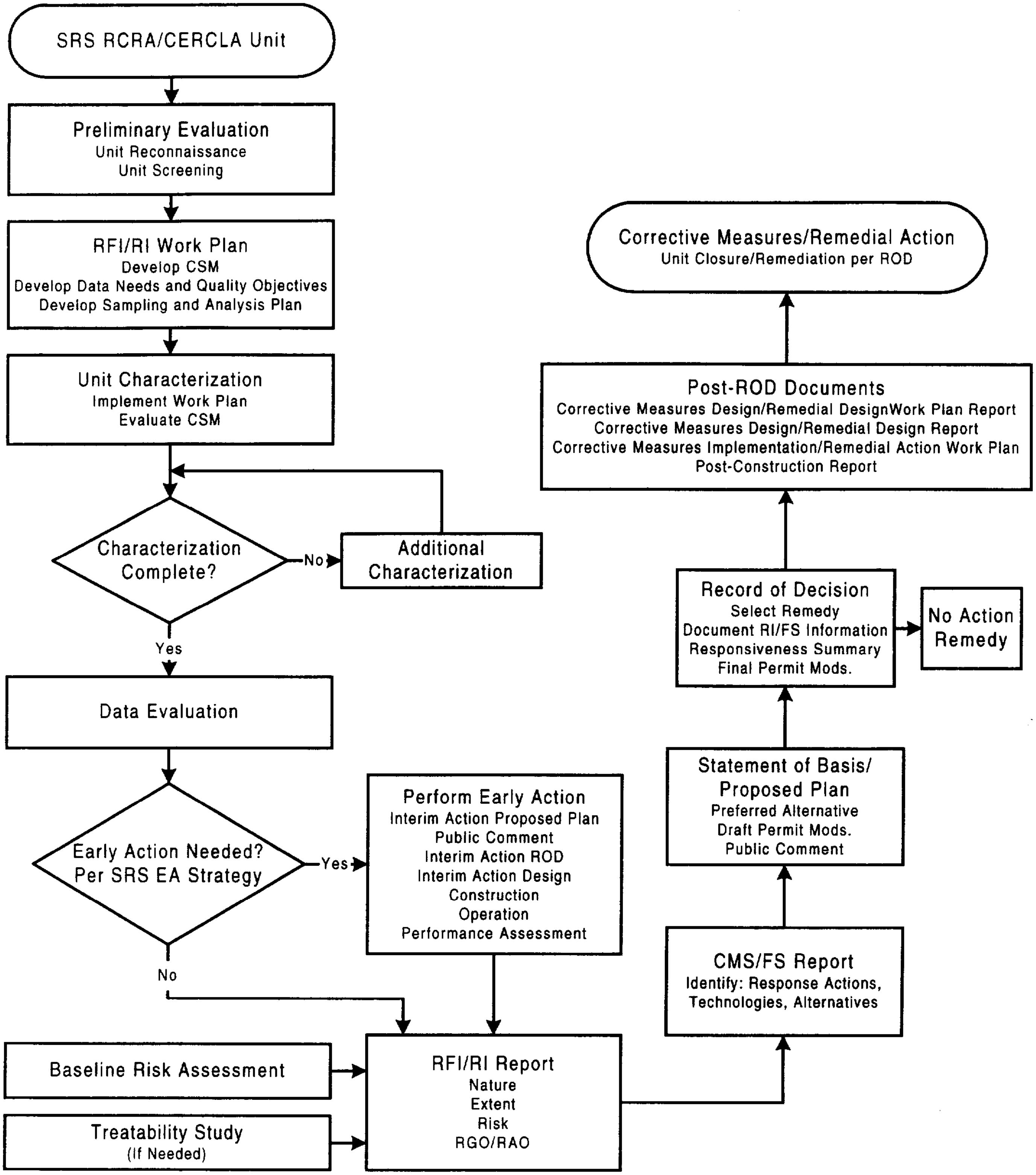


Figure 5. RCRA/CERCLA Logic Flowchart

Figure 6. CSM for the ORWBG

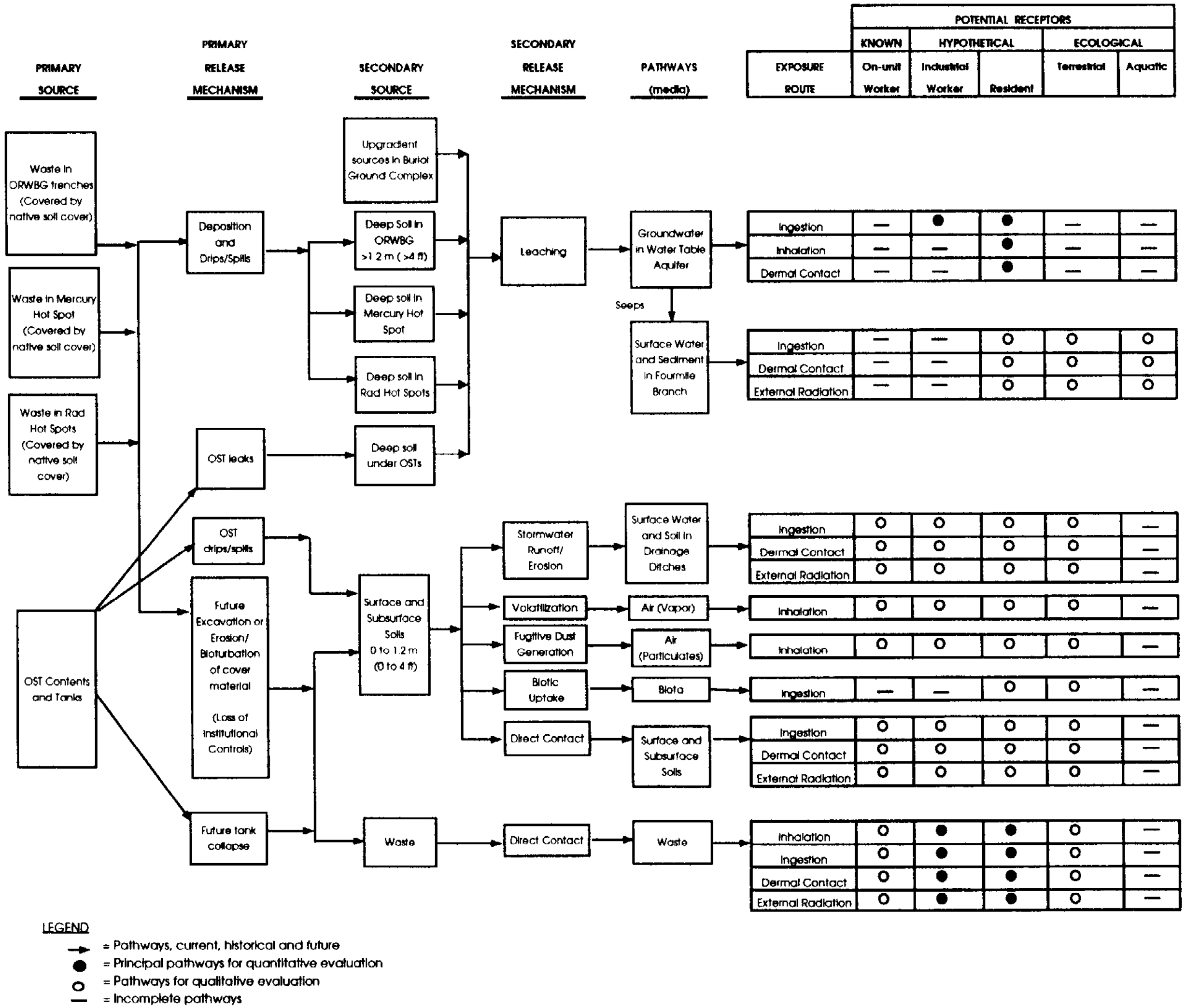
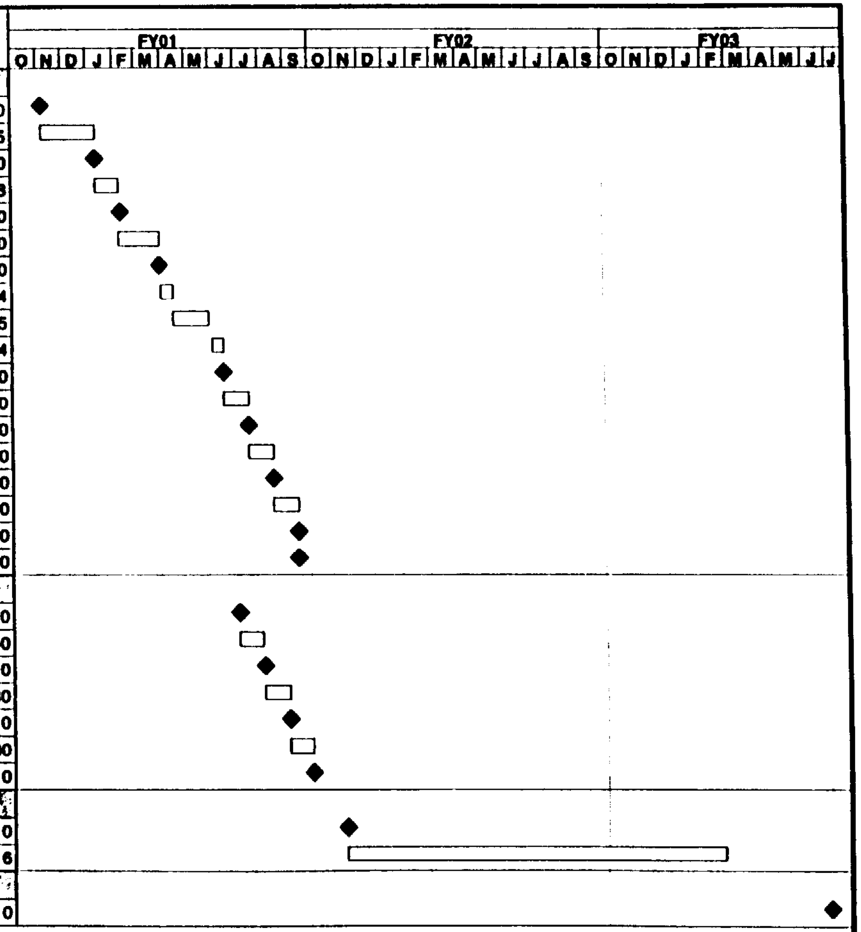


Figure 6. CSM for ORWBG

Activity ID	Activity Description	Early Start	Early Finish	Orig Dur
LCS 14 - STATEMENT OF BASIS/PROPOSED PLAN & ROD				
BLP02X1540	SRS SUBMITTAL OF REV. 0 SB/IAPP		06NOV00*	0
BLP02X1550	EPA/SCDHEC REVIEW REV. 0 SB/IAPP	07NOV00	10JAN01	65
BLP02X1555	EPA/SCDHEC RETURNS COMMENTS ON REV. 0 SB/IAPP		11JAN01*	0
BLP0201560	SRS INCORP EPA/SCDHEC REV. 0 SB/IAPP COMMENTS	12JAN01	08FEB01	28
BLP02X1570	SRS SUBMITTAL OF REV. 1 SB/IAPP		09FEB01*	0
BLP02X1580	EPA/SCDHEC FINAL REVIEW OF REVISED SB/IAPP	09FEB01*	30MAR01	50
BLP02X1590	EPA/SCDHEC FINAL APPROVAL OF SB/IAPP		30MAR01	0
BLP02X1595	NOTIFICATION OF PUBLIC COMMENT PERIOD	02APR01*	15APR01	14
BLP02X1596	PUBLIC COMMENT PERIOD FOR SB/IAPP	16APR01	30MAY01	45
BLP0208388	RESPONSIVENESS SUMMARY AND AGREEMENT	03JUN01	16JUN01	14
BLP0201610	SRS SUBMITTAL OF REV. 0 IROD		16JUN01	0
BLP0201620	EPA/SCDHEC REVIEW REV. 0 IROD	17JUN01	16JUL01	30
BLP0208420	EPA/SCDHEC RETURNS REV. 0 COMMENTS FOR IROD		16JUL01	0
BLP0208425	SRS INCORPORATE COMMENTS IROD	17JUL01	15AUG01	30
BLP0208435	SRS SUBMITTAL OF REV.1 IROD AND RESP. SUMMARY		16AUG01	0
BLP0208440	EPA/SCDHEC FINAL REVIEW REV. 1 IROD	17AUG01	15SEP01	30
BLP0208442	EPA/SCDHEC APPROVAL REV. 1 IROD		15SEP01	0
BLP0208445	SUBMIT FINAL SIGNED IROD		15SEP01	0
LCS 15 - DETAILED ENG & PRECONST ACTIVITIES				
BLP0208485	SRS SUBMITTAL OF REV. 0 ICMI/IRAIP		02JUL01	0
BLP0208490	EPA/SCDHEC REVIEW REV. 0 ICMI/IRAIP	03JUL01	01AUG01	30
BLP0208505	EPA/SCDHEC RETURN COMMENTS FOR REV. 0 ICMI/IRAIP		02AUG01	0
BLP0208510	SRS INCORPORATE EPA/SCDHEC COMMENTS ICMI/IRAIP	03AUG01	01SEP01	30
BLP0208515	SRS SUBMITTAL OF REV. 1 ICMI/IRAIP		01SEP01	0
BLP0208520	EPA/SCDHEC REVIEW OF ICMI/IRAIP	02SEP01	01OCT01	30
BLP0208525	EPA/SCDHEC APPROVAL REV.1 ICMI/IRAIP		01OCT01	0
LCS 16 - CONSTRUCTION				
BLP0208483	INTERIM REMEDIAL ACTION START	12NOV01		0
BLP0208484	INTERIM REMEDIAL ACTION	12NOV01	18FEB03	316
LCS 17 - POST CONSTRUCTION ACTIVITIES				
BLP0208528	SUBMIT REV.0 IPCR		26JUN03	0



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Finish Date	26JUN03
Data Date	01OCT97
Run Date	21MAR01 15:35

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Early Bar
Progress Bar
Critical Activity

Sheet 1 of 1

Environmental Restoration
OST'S INTERIM ACTION
@ ORWBG
IMPLEMENTATION SCHEDULE

Date	Revision	Checked	Approved
3/21/01		BKO	BKO

Figure 7. Implementation Schedule for the OSTs

Table 1. Concentrations of Constituents of Interest in the OSTs

	Inventory for Contaminants of Interest (µCi for radionuclides, ppm for chemicals)																									
	H-3		Co-60		Sr-90		Tc-99		Cs-137		U-238		Np-237		Pu-238		Pu-239		Cadmium		Lead		Mercury		VOCs	
TANK	Liquids	Solids	Liquids	Solids	Liquids	Solids	Liquids	Solids	Liquids	Solids	Liquids	Solids	Liquids	Solids	Liquids	Solids	Liquids	Solids	Liquids	Solids	Liquids	Solids	Liquids	Solids	Liquids	Solids
1	9.2E+01	<45	1.3E+01	<24	2.8E+05	4.4E-01	8.2E+02	ND	5.7E+03	<54	8.4E+02	2.0E+00	1.0E+02	<2.9	2.9E+05	3.6E+03	6.2E+03	<250	<1	ND	<1	ND	9.7E+01	ND	3.6E+00	ND
2	3.1E+02	<36	<.79	<3190	7.6E+02	7.9E-02	4.0E+01	ND	7.8E+03	5.6E+05	ND	2.2E+02	4.4E+01	<277	6.0E+03	1.5E+07	<840	<76700	<0.1	ND	<1	ND	8.7E+00	ND	<DLs	ND
3	1.1E+03	2.5E+02	1.4E+01	<115	5.2E+04	7.8E+02	4.7E+02	ND	4.4E+04	1.8E+04	2.8E+03	3.0E+02	2.8E+02	1.5E+02	1.5E+04	7.9E+04	1.6E+04	1.9E+04	<1	ND	<2	ND	2.0E+00	ND	1.8E+00	ND
4	3.8E+03	ND	<29	<2.9	1.7E+04	<271	1.1E+03	ND	1.4E+05	3.1E+03	8.7E+03	2.3E+05	<335	<7.2	2.3E+04	1.1E+04	<63600	1.0E+03	1.3E+00	ND	<3.7	ND	7.6E+00	ND	<DLs	ND
5	ND	ND	<5600	<.11	ND	ND	ND	ND	4.0E+06	6.0E+00	3.2E+03	8.3E-02	<172	<.877	1.1E+06	4.5E+02	7.9E+04	2.4E+01	4.0E-01	ND	8.6E+00	ND	4.6E-01	ND	<DLs	ND
6	5.0E+03	ND	1.5E+02	1.1E+02	1.0E+03	5.5E+04	1.7E+03	ND	9.0E+04	1.3E+04	8.9E+02	3.7E+03	<234	1.5E+02	1.3E+04	5.4E+05	<47400	9.1E+04	2.0E-01	ND	<9	ND	9.2E+00	ND	<DLs	ND
7	1.1E+03	ND	<21.5	<2.29	1.9E+05	1.8E+04	4.0E+04	ND	1.8E+04	2.1E+03	1.3E+04	8.6E+03	8.1E+02	9.0E+00	2.1E+05	1.1E+04	1.2E+05	1.8E+04	1.7E+00	ND	<4.6	ND	2.6E+01	ND	<DLs	ND
8	9.4E+02	ND	<185	<55	5.0E+03	5.4E+04	6.1E+02	ND	4.4E+05	5.1E+05	3.1E+02	1.0E+01	<269	7.9E+00	1.4E+04	4.2E+04	<23600	7.4E+03	2.0E-01	ND	<1	ND	3.0E+00	ND	1.3E+01	ND
9	No Samples were Analyzed for Tank S09																									
10	No Samples were Analyzed for Tank S10																									
11	ND	ND	3.4E+01	<.034	ND	ND	ND	ND	5.3E+04	2.4E+01	<2.6	5.7E-03	2.7E-01	<.00644	1.4E+05	9.3E+01	2.4E+03	5.7E+00	3.0E-01	ND	8.9E+00	ND	1.2E+00	ND	<DLs	ND
12	No Samples were Analyzed for Tank S12																									
13	4.1E+02	ND	8.6E+01	6.5E+00	2.4E+04	2.3E+04	2.6E+03	ND	1.1E+05	3.6E+04	2.8E+03	<46.2	<406	2.2E+01	6.2E+05	2.1E+05	<37600	1.2E+04	1.1E+00	ND	<3.6	ND	1.5E+00	ND	1.0E+03	ND
14	1.2E+03	ND	5.8E+01	8.6E+00	8.1E+04	ND	1.6E+03	ND	5.9E+04	1.3E+02	5.1E+03	1.1E+02	1.1E+03	8.7E-01	1.5E+05	6.3E+04	1.2E+04	4.0E+02	1.0E+00	ND	<2	ND	1.0E+01	ND	6.7E-01	ND
15	ND	ND	ND	7.8E-04	ND	ND	ND	ND	ND	4.2E-01	ND	1.7E-02	ND	7.8E-04	ND	4.3E-01	ND	5.7E-01	ND	8.0E-01	ND	6.9E+01	ND	1.1E+02	ND	<DLs
16	ND	ND	ND	<2360	ND	ND	ND	ND	ND	2.3E+05	ND	5.3E+04	ND	<6510	ND	1.5E+06	ND	1.5E+06	ND	4.0E+00	ND	2.6E+02	ND	7.9E+01	ND	<DLs
17	No Samples were Analyzed for Tank S17																									
18	No Samples were Analyzed for Tank S18																									
19	7.0E+03	<166	1.4E+03	<1820	1.4E+05	ND	4.0E+03	ND	2.5E+05	5.9E+04	3.0E+04	8.6E+03	1.0E+03	3.6E+03	8.8E+06	5.2E+06	2.3E+04	2.1E+05	2.0E+00	6.0E+00	7.0E+00	4.3E+02	6.5E-01	4.2E+02	5.3E+00	ND
20	1.0E+04	<582	5.8E+01	<576	1.3E+04	1.1E+01	1.1E+04	1.1E+00	1.2E+05	4.9E+04	1.2E+04	3.3E+03	1.9E+03	1.0E+02	4.2E+06	5.3E+05	9.4E+04	6.0E+04	<1	4.0E+01	<2	2.9E+03	1.3E+01	4.6E+02	8.6E+00	ND
21	3.1E+03	1.4E+03	7.3E+00	<476	6.5E+03	2.6E+03	4.7E+02	ND	3.9E+04	7.3E+03	2.1E+03	3.1E+02	1.6E+02	1.2E+05	3.2E+05	5.6E+05	8.7E+03	4.0E+04	<1	5.0E+00	<1	6.8E+01	4.9E-01	<0.01	1.8E+00	<DLs
22	7.9E+03	ND	5.7E+01	3.8E+01	5.5E+03	3.7E+02	8.4E+02	ND	1.3E+05	2.3E+04	1.7E+03	<7.53	3.5E+02	2.2E+01	4.7E+05	3.0E+05	<77100	2.0E+04	2.0E-01	7.0E+01	<9	5.0E+02	7.4E-01	6.2E+01	<DLs	<DLs

ND - No Data

"<" - Result less than the detection limit

DL - Detection Limit

Table 2. OST Alternatives

Alternative	Liquids			Solids		
	Vitrification	Grouting	Removal/Storage	Vitrification	Grouting	Removal/Storage - TRU Pads
OST I-a						
OST II-d	X			X		
OST II-e		X			X	
OST II-f			X		X	
OST II-j			X			X

Tanks would be stabilized under all alternatives except No Action (OST I-a).

The final remedy for the ORWBG (including institutional controls and an infiltration control system) will also be applied to the OSTs.

Table 3. ARARs for the Selected Remedy

Citation(s)	Status	Requirement Summary	Reason for Inclusion
Chemical			
40 CFR 61.92 National Emission Standards for Hazardous Air Pollutants	Applicable	Emissions of radionuclides to the ambient air from Department of Energy facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr	Remedial activities could generate airborne radionuclides.
10 CFR 835 Occupational Radiation Protection	Applicable	Establish radiation protection standards, limits, and program requirements for protecting individuals from ionizing radiation resulting from the conduct of USDOE activities 10 CFR 835.1001 mandates as low as reasonably achievable (ALARA) principles	Establishes dose limits for employees, members of the public during direct on-site access. Establishes monitoring requirements, posting and labeling requirements
Action			
40 CFR 50.6, and SC R.61-62.5 Standard 2 Ambient Air Quality Standard	Applicable	The concentration of particulate matter (PM_{10}) in ambient air shall not exceed 50 ug/m^3 (annual arithmetic mean) or 150 ug/m^3 (24-hour average concentration)	Operation of heavy equipment will generate airborne dust that will have the potential to exceed the levels specified. Dust suppression will likely be required to minimize dust emissions.
SC R.61-62.6 Fugitive Dust	Applicable	Emission of fugitive particulate matter shall be controlled in such a manner and to the degree that it does not cause undesirable air pollution	Construction activities shall minimize fugitive emissions. Operation of heavy equipment has the potential to generate airborne particulate matter.
SC R.72-300 Standards for Stormwater Management and Sediment Reduction	Applicable	Storm water management and sediment control plan for land disturbances	Construction activities, including operation of heavy equipment, will require an erosion control plan.
40 CFR 264.197, SCR.61-79.264.197 Federal and State Hazardous Waste Regulations, Tank System Closure and Post Closure Care	Relevant and Appropriate	If tanks are closed with waste left in place, the tank system must be closed and perform the post-closure care requirements that apply to landfills (Section 264.310)	This requirement addresses problems or situations similar to the circumstances of the anticipated final response action. The other solvent tanks and parts of the burial ground were closed per this requirement.

CFR = Code of Federal Regulations
SCR = South Carolina Regulations

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Table 4. Comparative Analysis of Alternatives - OSTs

EVALUATION CRITERIA	OST I-a No Action	OST II-d Vitrification	OST II-e Grouting	OST II-f Remove liquids to CIF, then Grout	OST II-j Remove liquids and solids, solidify for disposal at TRU Pads, then Grout
Overall Protection of Human Health and the Environment					
Human Health	Not protective. Does not prevent intrusion.	Protective.	Protective.	Protective.	Protective.
Environment	Not protective. Does not stabilize unit. Does not mitigate leaching of tank contents.	Protective.	Protective.	Protective.	Protective.
Compliance with ARARs					
Chemical-Specific	Does not comply with ARARs.	Complies with all ARARs.	Complies with all ARARs.	Complies with all ARARs.	Complies with all ARARs.
Location-Specific	None.	None.	None.	None.	None.
Action-Specific	None.	Complies with all ARARs.	Complies with all ARARs.	Complies with all ARARs.	Complies with all ARARs.

Table 4. Comparative Analysis of Alternatives – OSTs (Continued)

EVALUATION CRITERIA	**OST I-a** **No Action**	**OST II-d** **Vitrification**	**OST II-e** **Grouting**	**OST II-f** **Remove liquids to CIF, then Grout**	**OST II-j** **Remove liquids and solids, solidify for disposal at TRU Pads, then Grout**
Long-Term Effectiveness and Permanence					
Magnitude of Residual Risks	Without tank stabilization, the tanks pose a risk to an inadvertent intruder, and tank failure and collapse would eventually occur.	Vitrification would preclude intrusion and would stabilize the unit by preventing collapse.	Grouting would preclude intrusion and would stabilize the unit by preventing collapse.	Intrusion of liquids would be mitigated by source removal. Grouting would preclude intrusion of the solids and would stabilize the unit by preventing collapse.	Intrusion would be mitigated by source removal. Grouting would stabilize the unit by preventing collapse.
Permanence	Not Applicable. There are no remedy components.	Permanent. Vitrification is one of the most permanent remedial solutions for isolating waste.	Permanent. Even though grout eventually deteriorates in the very long-term, the resulting material would still prevent tank collapse.	Permanent. Even though grout eventually deteriorates in the very long-term, the resulting material would still prevent tank collapse.	Permanent.
Reduction in Toxicity, Mobility, or Volume Through Treatment					
Degree of Expected Reduction in Toxicity	No reduction other than natural radioactive decay.	No reduction other than natural radioactive decay.	No reduction other than natural radioactive decay.	No reduction other than natural radioactive decay. Toxicity of liquids transferred to the receiving facility.	No reduction other than natural radioactive decay. Toxicity transferred to the receiving facility.

Table 4. Comparative Analysis of Alternatives – OSTs (Continued)

EVALUATION CRITERIA	OST I-a No Action	OST II-d Vitrification	OST II-e Grouting	OST II-f Remove liquids to CIF, then Grout	OST II-j Remove liquids and solids, solidify for disposal at TRU Pads, then Grout
Degree of Expected Reduction in Mobility	None.	Very high. Mobility of tank contents and some surrounding soils essentially eliminated by isolating the contamination in a glassy matrix.	High. Grouting would provide reduction in mobility by (1) increasing the structural stability of the tanks, thereby preventing the worst-case scenario of simultaneous tank collapse and failure, (2) incorporating some of the residual material into the grout matrix, and (3) providing a low permeability material (the grout itself) that would reduce infiltration through the tanks.	Very high. Mobility of liquids eliminated by incineration and conversion to ash. Grouting would provide reduction in mobility by (1) increasing the structural stability of the tanks, thereby preventing the worst-case scenario of simultaneous tank collapse and failure, (2) incorporating some of the residual material into the grout matrix, and (3) providing a low permeability material (the grout itself) that would reduce infiltration through the tanks.	Very high. Mobility transferred to the receiving facility and then eliminated by incineration and stabilization.

Table 4. Comparative Analysis of Alternatives – OSTs (Continued)

EVALUATION CRITERIA	OST I-a No Action	OST II-d Vitrification	OST II-e Grouting	OST II-f Remove liquids to CIF, then Grout	OST II-j Remove liquids and solids, solidify for disposal at TRU Pads, then Grout
Degree of Expected Reduction in Volume	None.	Negligible change in volume.	Volume increased by mixing with grout.	Negligible change in volume on-unit. Extensive pretreatment of the liquids, including blending, would be required to meet CIF waste acceptance criteria. This may increase the volume of the liquids by 1000 times. Volume is eventually minimized by incineration and conversion to ash. Volume of waste increases as materials and equipment become contaminated during removal, handling, staging, transportation, and storage.	Volume eliminated on-unit. Volume of liquids and solids eventually increased during off-unit stabilization for dispositioning at the TRU Pads. Volume increases as materials and equipment become contaminated during removal, handling, staging, transportation, and storage.

Table 4. Comparative Analysis of Alternatives – OSTs (Continued)

EVALUATION CRITERIA	OST I-a No Action	OST II-d Vitrification	OST II-e Grouting	OST II-f Remove liquids to CIF, then Grout	OST II-j Remove liquids and solids, solidify for disposal at TRU Pads, then Grout
Short-Term Effectiveness					
Risk to Workers	None. No onsite activity.	Minimal to moderate risk to create new access points in each tank to inject frit. Moderate risk associated with the possibility of direct exposure to tank contents and heavy equipment use.	Minimal risk associated with grout injection. Risk is slightly higher for high pressure applications than for low pressure applications. Moderate risk associated with the possibility of direct exposure to tank contents and heavy equipment use.	Moderate risk associated with removal of the liquids, staging, transportation, storage, pretreatment, and disposal. Moderate risk associated with high-pressure grout injection. Risk is higher for high pressure applications than for low pressure applications. Minimal risk associated with heavy equipment use.	Moderate to high risk associated with removing liquids and solids, staging, transportation, storage, pretreatment, and disposal. Removal would necessitate extensive intrusive activities, including creation of new access points in each tank and physical or chemical removal of the hardened sludges on the tank walls. Minimal risk associated with grout injection. Risk is slightly higher for high pressure applications than for low pressure applications. Minimal risk associated with heavy equipment use.
Risk to Community	None. No onsite activity.	No exposure concerns; unit is located several miles from the nearest SRS boundary. Negligible increase in off-SRS vehicular traffic.	No exposure concerns; unit is located several miles from the nearest SRS boundary. Negligible increase in off-SRS vehicular traffic.	No exposure concerns; unit is located several miles from the nearest SRS boundary. Negligible increase in off-SRS vehicular traffic.	No exposure concerns; unit is located several miles from the nearest SRS boundary. Negligible increase in off-SRS vehicular traffic.

Table 4. Comparative Analysis of Alternatives – OSTs (Continued)

EVALUATION CRITERIA	OST I-a No Action	OST II-d Vitrification	OST II-e Grouting	OST II-f Remove liquids to CIF, then Grout	OST II-j Remove liquids and solids, solidify for disposal at TRU Pads, then Grout
Time until Protection is Achieved	Protection not achieved.	6 to 12 months after ROD is approved.	6 to 12 months after ROD is approved.	30 years With current backlog at CIF, incineration of OST liquids could begin in 20 years. Incineration of the blended OST liquids expected to take 10 years.	12 to 18 months after ROD is approved.
Implementability					
Availability of Materials, Equipment, Contractors	No materials, equipment, or contractors required.	Limited number of qualified contractors for vitrification.	Minor difficulties in selecting qualified contractors for grouting. Grouting uses standard construction equipment with some specialized attachments.	CIF not available for 20 years. New tanks may be needed to accommodate waste at NSSTs. Minor difficulties in selecting qualified contractors for removal.	No facility is available at present at SRS to stabilize/package the waste. Minor difficulties in selecting qualified contractors for removal.
Administrative Feasibility/ Regulatory Requirements	No administrative constraints to implementation.	None.	None.	Evaluation of regulatory and waste acceptance requirements at CIF. CIF has low inventory limits for radionuclides. CIF blowdown must meet very strict waste acceptance criteria for alpha contamination at the ETF.	Evaluation of regulatory and waste acceptance requirements at the TRU Pads. Pretreated TRU waste should satisfy the requirements needed for disposal at WIPP.

Table 4. Comparative Analysis of Alternatives – OSTs (Continued)

EVALUATION CRITERIA	OST I-a No Action	OST II-d Vitrification	OST II-e Grouting	OST II-f Remove liquids to CIF, then Grout	OST II-j Remove liquids and solids, solidify for disposal at TRU Pads, then Grout
Technical Feasibility	Readily implementable.	Some concerns since in-situ vitrification is an emerging technology and not widely proven. Off-gas hood may be required, and additional access points will be necessary to add glass frit.	Implementable. The techniques used for construction are well understood. Injecting the grout, and developing the correct grout "recipe" present some feasibility challenges.	Extensive pretreatment would be required to meet waste acceptance criteria of the CIF.	Pretreatment would be required to meet WIPP waste acceptance criteria. Some difficulty in determining a solidification medium that will ensure a stable waste form with no resulting free-standing liquid.
Monitoring Considerations	None.	Minor process confirmation testing. No long-term monitoring requirements.	Minor process confirmation testing. No long-term monitoring requirements.	Minor process confirmation testing after grouting. No long-term monitoring requirements at the unit. Monitoring requirements of liquids transferred to the receiving facility.	Minor process confirmation testing after grouting. No long-term monitoring requirements at the unit. Monitoring requirements of liquids and solids transferred to the receiving facilities.
Cost					
Capital Cost O&M Cost	\$0 \$32,000	\$11.0 million \$82,000	\$4.3 million \$82,000	\$186.9 million \$82,000	\$24.1 million \$82,000
Total Present Value	\$32,000	\$11.1 million	\$4.4 million	\$190.0 million	\$24.2 million

The final remedy for the ORWBG (including institutional controls and an infiltration control system) will also be applied to the OSTs.

Costs for institutional controls (long-term monitoring and access controls) and an infiltration control system (low permeability cap/cover) are not included in these estimates because they are included in the final remediation costs for the ORWBG as a whole.

Table 5. Cost Estimate for Alternative OST-IIe, Grout OSTs

WBS		DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
DIRECT CAPITAL COSTS						
101		PREPARATION				
	101.1	Treatability Study (laboratory testing)	1	LS	400,000	$400,000
	101.2	Mobilization/Demobilization	1	LS	50,000	$50,000
	101.3	Site Preparation & Decontamination Pad	1	LS	50,000	$50,000
102		IN-SITU GROUTING				
	102.1	Subcontractor/Construction	1	LS	771,687	$771,687
	102.2	Grout Pump, Truck (26 weeks)	1	LS	55,405	$55,405
	102.3	Mounted,Rental,4" line,80' boom(20 ton crane (26 weeks))	1	LS	40,015	$40,015
	102.4	RCO non-exempt (3)	1	LS	165,110	$165,110
	102.5	Industrial hygiene (1)	1	LS	44,453	$44,453
	102.6	Hepa Filters (22)	1	LS	27,286	$27,286
	102.7	Grout/CLSM (1,518 CY)	1	LS	150,616	$150,616
	102.8	Rad Containment Structure (22)	1	LS	13,643	$13,643
	102.9	Construction Engineer, exempt.	1	LS	130,187	$130,187
103		POST-CONSTRUCTION				
	103.1	Survey	1	LS	3,000	$3,000
	103.2	Final Safety Inspection	1	LS	6,000	$6,000
	103.3	Documentation	1	LS	16,000	$16,000
TOTAL DIRECT CAPITAL COSTS						$1,923,402
INDIRECT CAPITAL COSTS						
		Engineering and design (15% of total direct capital cost)				$288,510
		Project/construction management (30% of total direct capital cost)				$577,021
		Health and safety (10% of total direct capital cost)				$192,340
		Overhead markups (40% of total direct capital cost)				$769,361
		Contingency (30% of total direct capital cost)				$577,021
TOTAL INDIRECT CAPITAL COSTS						$2,404,253
TOTAL ESTIMATED CAPITAL COSTS						$4,327,655
O&M COSTS						
		ROD Reviews (every five years for 30 years)	6	ea	15,000	
		Inspections and Maintenance ($4,000 per year for 30 years)	1	/yr	4,000	
		Number of Years 30				
		Interest Rate (i) 0.07				
		Present Worth of ROD Reviews				$32,367
		Present Worth of Inspections and Maintenance				$49,636
TOTAL ESTIMATED O&M COSTS						$82,003
TOTAL ESTIMATED COST						$4,409,658

Because the time to construct is short, the present worth of capital costs equals the total estimated capital cost in constant (non-discounted) dollars.

APPENDIX A - RESPONSIVENESS SUMMARY

The 45-day public comment period for the SB/IAPP for the OSTs began on April 4, 2001 and ended on May 18, 2001. The SB/IAPP was also presented to the Environmental Restoration Committee of the SRS Citizens Advisory Board (CAB) in an open public meeting on April 23, 2001. Specific comments and responses are found below.

Public Comments

Comment 1: *I support the proposed action's preferred alternative (ost ii-3) to completely grout the solvent tanks in place. (Bill Lawless).*

Thank you for your participation in the decision-making process. USDOE, SCDHEC, and USEPA agree that grouting is the most viable and cost-effective alternative to prevent tank collapse.

Comment 2: *I am concerned that the closure cost is excessive, and I request that the agencies involved do a better job in figuring out how to reduce future costs to the taxpayer for this type of closure; I am particularly concerned that money must be expended to modify the RCRA permit; if the closure plan is technically sound, if all parties including regulators and stakeholders agree to the closure plan, why isn't the permit modification included as a part of the agreement? Not being a part of the final agreement means there is more opportunity for bureaucratic or administrative costs above and beyond the costs of closure, reducing the funds available for future closures. (Bill Lawless).*

The ORWBG, which includes the OSTs, is regulated by both the SRS Federal Facility Agreement and the SRS RCRA Permit (SCI 890 008 989) under a streamlined remedial process that integrates and combines the requirements of CERCLA and RCRA. Because grouting the tanks is permanent and there are no plans to reverse the action, a modification to the RCRA Permit is required to acknowledge the end-state of the tanks. To minimize any additional costs required under RCRA, the three parties (US DOE, US EPA, and SCDHEC) have agreed that many of the CERCLA documents required can be used to satisfy RCRA as well. While stakeholders are asked to comment on the IAPP to satisfy the CERCLA public participation requirements, the stakeholders are given an opportunity to comment on the draft RCRA permit language to satisfy the RCRA public participation requirements at the same time. After the comment period has ended, the IROD is signed and the RCRA permit is issued simultaneously.

As reflected in the SB/IAPP, agreement on the remedial strategy among the three parties has been reached; that consensus will serve to

expedite the permit modification without significant delay or cost. Furthermore, because there are other parts of the ORWBG that require remediation, the RCRA permit modification for the final action at the ORWBG will simply require updating to include the other areas, and thus the permit modification for the final action should not require significant time and cost expenditure.

Comment 3: *I agree with the preferred alternative of grouting the old solvent tanks. The risks shown in the report for all alternatives are quite low and do not allow your reviewers to differentiate between alternatives. For me to reach my conclusion on this alternative required considerable study of previously published information on these solvent tanks. The major contributor to my decision is to prevent collapse of the solvent tanks with the ensuing collection of precipitation to overflow and then release of the contents of the tanks to surface and flow to the Four-Mile Branch. This would occur in the No Action Alternative (OST Ia) if no remediation were performed. The risks from this event should have been included in the report. The $1.9 million dollars for this grout alternative should eliminate this concern. (W. Lee Poe, Jr.).*

Two types of risks are identified in the SB/PP: (1) risks to the workers and community during implementation of the remedy, and (2) residual risks to human health and the environment that remain after implementation is complete. These are summarized below.

(1) The comparative analysis identifies that grouting poses lower risk to workers than vitrification or removal. There is no exposure risk to the community for any of the alternatives because the OSTs are located within a secured government facility (SRS); the community will not be allowed near the unit during remediation.

(2) The residual risks remaining after implementation of each alternative would be similar for all alternatives (except the No Action base case alternative), as all alternatives would prevent tank collapse. No Action would clearly pose unacceptable risks, as the tanks could collapse in the future. The potential scenario you describe (collection of precipitation and overflow) is one of several potential exposure scenarios under No Action that could present an unacceptable risk to human health and the environment. Although the SB/IAPP does not specifically describe each potential release mechanism if No Action were selected, it recognizes that tank collapse and release of the tank contents to the environment should be prevented. USDOE, SCDHEC, and USEPA agree that grouting is the most viable and cost-effective alternative to prevent tank collapse.

Comment 4: *Section V should be strengthened and misleading information corrected. For example, in the Contaminant Fate and Transport Analysis (on pages 6 and 7, the italicized subtitles Unacceptable Risk to Surface Waters and Unacceptable Risk to Groundwater Quality Under the ORWBG infer the condition to be unacceptable. The remainder of the paragraphs says no unacceptable risk exists. In both paragraphs, the closing statements are "does not pose a current or future risk to the community". Correct the italicize subheading. (W. Lee Poe, Jr.).*

Modeling indicates that if a worst-case scenario were to occur (instantaneous and simultaneous release of the contents of all 22 tanks), groundwater under the unit might be impacted above MCLs. This represents an "unacceptable risk to groundwater quality". However, as stated in the SB/IAPP, contaminant migration to groundwater does not pose a risk to the community because public use of groundwater under the ORWBG is prohibited, and USDOE has taken steps to prevent residential water usage in the future.

The interim action will help to reduce mobility of the residual tank contents by (1) preventing simultaneous tank failure and release, (2) incorporating some of the contaminants into the grout matrix, and (3) reducing rainwater infiltration through the tank contents. To further reduce the risk of leaching, USDOE, SCDHEC, and USEPA have agreed that an infiltration control system will be placed over the OSTs as part of the final action for the ORWBG. This will be detailed in the final ROD for the ORWBG.

Comment 5: *I could find no information supporting the Conclusion on page 7. The text says the risk is small for all alternatives. The remainder of the Section V seems to support the opposite conclusion that the risk is minimal. (W. Lee Poe, Jr.).*

The conclusion that a release may present a "threat to public health, welfare, or the environment" is reached primarily because of the exposure risk that would occur if the tanks were to structurally fail and the contents become more accessible to the public and/or spread into the environment. Section V provides an example of this unacceptable risk: "For example, if an inadvertent intruder were to access the tanks, unacceptable exposure would occur and the waste could be released into surrounding soils where it may impact plants and animals". This risk is mitigated by grouting the tanks.

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Comment 6: *The second paragraph of Section VII, says existing institutional controls will be maintained until a final remedy is selected. That is a comforting statement but I could not find IC the paragraph is talking about. The IC's should be discussed in either Section III or IV. (W. Lee Poe, Jr.).*

Existing institutional controls will be maintained until a final remedy is selected. Existing institutional controls include (1) physical access controls to prevent unauthorized entry to SRS and the ORWBG (fences, guards, security patrols, etc.), (2) administrative controls (SRS is a secured government facility with land use restrictions), and (3) routine inspection and site maintenance of the ORWBG and OSTs (maintenance of signs, erosion control, etc.). USDOE, SCDHEC, and USEPA have agreed that institutional controls will also be a component of the final action for the ORWBG. These will be detailed in the final ROD for the ORWBG.

Comment 7: *I do not think the heavy alpha emitters (last paragraph on page 3) will settle out of the solvent with aging. This is technically inaccurate statement. The organic currently in the CIF storage tanks (the solvent that was transferred from the ORWBG solvent tanks) still has significant alpha activity in the organic phase. (W. Lee Poe, Jr.).*

SRS agrees that significant alpha activity remains in the organic phase. However, sampling of each phase demonstrates that activities of alpha emitters are higher in the sludge/solid phase than in the organic phase, indicating that some of the alpha contamination settles out in the sludge/solid phase. The proposed remedy will prevent tank collapse, thus limiting exposure to any of the phases that remain in the tanks.

Comment 8: *I see no justification for the vitrification or the removal alternatives. I hope that the agreement on the interim action will not include those two alternatives. They are much more expensive and do not provide greater risk mitigation. (W. Lee Poe, Jr.).*

Thank you for your participation in the decision-making process. USDOE, SCDHEC, and USEPA agree that grouting is the most viable and cost-effective alternative to prevent tank collapse.

CAB Recommendations

None.